IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	CLEMENT et al.	Examiner:	Unknown
Serial No.:	10/057525	Group Art Unit:	1733
Filed:	January 24, 2002	Docket No.:	7500.376US01
Title:	CURING OF ADHESIVE MATERIALS PARTICULARLY FOR GLAZING APPLICATIONS		

CERTIFICATE UNDER 37 CFR 1.10:
"Express Mail" mailing label number: EV 077886175 US
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By: _____
Name: John Junters

SUBMISSION OF PRIORITY DOCUMENT(S)

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Applicants enclose herewith one certified copy of a United Kingdom application, Serial No. 0102034.6, filed January 25, 2001, the right of priority of which is claimed under 35 U.S.C. § 119.

Respectfully submitted,

MERCHANT & GOULD P.C.
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Dated: May 17, 2002

By _____
John J. Gresens
Reg. No. 33,112

JJG/nel

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Dated 25 March 2002

Patents Form 1/77

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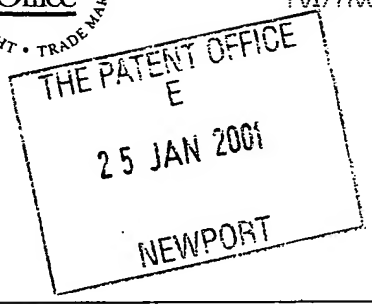
(;16)



26JAN01 E601042-1 D02835
P01/7700 0.00-0102034.6

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(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference

P450547

2. Patent application number
(The Patent Office will fill in this part)

0102034.6

25 JAN 2001

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Carglass Luxembourg Sarl-Zug Branch,
Aegeristrasse 33,
CH-6300 Zug,
Switzerland.

Patents ADP number *(if you know it)*

7778723001

If the applicant is a corporate body, give the country/state of its incorporation

Switzerland

4. Title of the invention

Curing of Adhesive Materials Particularly for Glazing Applications

5. Name of your agent *(if you have one)*

Urquhart-Dykes & Lord,

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Alexandra House,
Alexandra Road,
~~Seansea~~, Swansea
SA1 5ED.

Patents ADP number *(if you know it)*

1644005

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
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9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	–
Description	8
Claim(s)	3
Abstract	–
Drawing(s)	1 + 1

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Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	1
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature Urquhart-Dykes & Lord

Date 25-01-2001

12. Name and daytime telephone number of person to contact in the United Kingdom

G.M. Davies,
01792 474327

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Curing of Adhesive Materials Particularly for Glazing Applications

The present invention relates to curing of adhesive materials particularly for glazing applications.

Modern automotive glazing is typically bonded into the vehicle using polyurethane (pu) adhesives. These adhesives tend to be moisture cured, but thermally curing versions have been used. When a glazing panel (such as a front screen glazing panel) is replaced, the customer is advised not to use the vehicle for a prescribed period, known as the "drive away" time. In this time the pu adhesive material forms a skin on its surface and whilst it is not completely solid, the adhesive and cohesive forces are sufficient to keep the glazing panel in place, in the event of a collision. The forces exerted on the front screen glazing panel during an impact are due not only to its own inertia but also result from the inflation and operation of airbags where present. The adhesive bonding material and glazing panels also provide vehicle strength and rigidity in the event of a roll over. It is clear that any adhesive material and application process must ensure vehicle integrity and the safety of the occupants.

The drive away time is specified by the pu adhesive bonding material manufacturer and is provided normally in tabular form. The table provides a glass replacement fitter with a time in minutes or hours for a range of ambient temperature and humidity. The figures in the table represent what the pu manufacturer knows to be safe times for adhesive to reach adequate mechanical strength. The quoted figure will also include a safety margin (probably 200%) on bonding strength to account for likely impact

forces and variations in the adhesive product.

An improved technique and apparatus for glazing (particularly automotive glazing) has been devised.

It has surprisingly been found that applying heat to the pu adhesive bonding material for a set period of time (dependent on the heating apparatus) accelerates the gel and cure time of the adhesive. Once the pu adhesive material temperature has been elevated to an optimum temperature the heating mechanism is removed and the adhesive is allowed to cool. This temperature elevation has surprisingly been found to increase the rate of cure. Realisation of this accelerated cure rate in the field results in faster drive away times.

According to a first aspect therefore, the present invention provides a method of securing a glazing panel with an adhesive bonding material, the method comprising subjecting the bonding material to a predetermined temperature regime, the predetermined temperature regime having:

i) a period of heating the bonding material at a predetermined level; and

ii) a subsequent period of curing at a temperature significantly below the heating temperature level in step (i).

It is preferred that the predetermined level to which the adhesive bonding material is heated is substantially at or above 50°C.

It has been found that, particularly where the adhesive bonding material is heated to 70°C ± 7°C and then left to

cure (typically at ambient conditions of temperature and humidity), the pre-heating process increases the rate of gelling and so curing.

The heating of the adhesive bonding material is therefore preferably tailored to elevate the temperature of the bulk of the material to 70°C ± 7°C. Bulk heating technology such as rf/microwave, dielectric or ultrasound can be utilised to cause this temperature elevation. Other energy delivery techniques (preferably bulk heating techniques) may be utilised.

The adhesive bonding material is preferably a "moisture cure" material preferably a moisture cure polyurethane adhesive bonding material. The surprising subsequent rapid curing of "moisture cure" adhesive following application of the temperature regime in accordance with the invention is marked. "Moisture cure" is a term well known in the art; an alternative category of adhesive bonding material is commonly referred to as "heat cure" material. "Moisture cure" as used in the art typically refers to a bonding material which cures under ambient conditions in the presence of moisture/humidity. "Heat cure" is a term employed in the art meaning an adhesive bonding material which cures primarily through the application of heat substantially throughout the entire curing process.

The rate of gelling/curing of the pre-heated adhesive bonding material has been found to be at least twice that of adhesive bonding material not treated with the procedure of the invention. It is the conclusion that the drive away time of a vehicle can be reduced if the pu adhesive bonding material is preheated for a finite length of time and then left to undertake a normal "moisture" (humidity) cure.

It is preferred that the heating (temperature elevation

stage of the process) should not be applied to an extent such that an upper temperature limit is exceeded. If this occurs, it has been found that gelling or curing of the adhesive material is imparted. Preferably gelling and curing of the adhesive material occurs following the heating stage.

Samples were tested at intervals of 5 minutes for surface tackiness using a white card. This a test specified by the pu manufacturer as an on site method for checking for suitable gelling of the adhesive. To pass the test the white card must touch the pu surface and be removed without any black adhesive being attached. From the in house testing it has been shown that the preheating process increases the rate of gelling and so curing.

The heating to optimum temperature may be carried out when the glazing panel and adhesive bonding material (typically moisture cure pu) are in situ on the vehicle or when the adhesive is being dispensed by an applicator.

Heating of the adhesive material contemporaneously with dispensing of the adhesive material is preferred. The adhesive material is typically dispensed (preferably extruded) onto either the back face perimeter of the glazing panel/windscreen or onto the vehicle aperture.

The adhesive material is preferably dispensed/extruded using an applicator device (such as an applicator extrusion gun).

According to a second aspect, the invention therefore provides an applicator device for dispensing adhesive material, the applicator device including heating means for heating the adhesive material prior to or during dispensing of the adhesive material from the applicator.

The device preferably includes a nozzle or nozzle receiving portion, the heater device being provided adjacent the nozzle or nozzle receiving portion. It is particularly preferred that the heating means is positioned and configured for heating of the adhesive material whilst present in the nozzle.

The heater is provided for the applicator device in order to permit the adhesive material temperature to be elevated as it is dispensed/extruded. The applicator device, as well as having adhesive material heating means, is preferably configured to accept the adhesive material in canister/package form (single or multi shot). Dispensing via a nozzle is preferred. Preferably disposable nozzles are provided. The operation of the applicator device may be similar to the standard technology utilised in the industry for applying adhesive for screen replacement. Adhesive material packages (typically for single shot) and nozzles may be fitted prior to use and removed and disposed of subsequently.

Although the curing technology described above has been described primarily for bonding windscreens (for which it is particularly convenient to reduce cure times), the system can be used on any bonded glazing, particularly such glazing utilising pu or other (moisture cure) adhesives.

The invention will now be further described in a specific embodiment by way of example only with reference to the accompanying drawings, in which:

Figure 1 is a sectional view of an applicator device for use according to the method of the invention;

Figure 2 is a front end elevation of the device of Figure 1; and

Figure 3 is a rear end elevation of the device of Figures 1 and 2.

Referring to the drawings, an extrusion device of generally known construction including an applicator trigger and extrusion piston is provided with a nozzle 1 to which is fitted a heater body 2. Nozzle 1 on body 2 is provided with complementary entry engaging screw thread formations 3, 4 to permit secure connection.

The heater body 2 includes electrodes 5, 6 actuatable to set up a bulk heating radio frequency field to elevate the temperature of adhesive material in the nozzle 1 to 70°C ± 7°C prior to the material being extruded from the end of nozzle 1. The rate of extrusion of the material is co-ordinated with the heat applied via electrodes 5, 6 to ensure that the Radio Frequency (RF) bulk heating of the adhesive material in the nozzle to ensure that extruded material has been heated to the required temperature.

Bulk heating of the material is preferred using an energy field which is substantially uniform through the bonding material. This promotes substantially uniform heating of the adhesive bonding material throughout the body of the material which results in uniform application of energy. The energy field is preferably electromagnetic and may comprise microwave energy (preferably directed by microwave wave guide) or alternatively Radio Frequency (RF) heating may be utilised.

As an alternative to the use of RF heating, the heater body 2 may include microwave generator means and/or a microwave guide means for bulk heating the adhesive material in nozzle 1 to the required temperature. As a further alternative, the heater body 2 may include an ultrasonic

generator and/or ultrasonic wave guide in order to effect bulk heating of the adhesive material in nozzle 1 by means of ultrasonic energy delivery. As a further alternative dielectric heating may be utilised.

The adhesive material is extruded by the applicator gun device either directly onto the glazing panel, or to the frame into which the glazing panel is to be secured. Thereafter, the prior heated adhesive material is allowed to cure under ambient conditions.

The adhesive bonding material is preferably a "moisture cure" material preferably a moisture cure polyurethane adhesive bonding material. "Moisture cure" is a term well known in the art, and an alternative category of adhesive bonding material is being referred to as "heat cure" material. "Moisture cure" as used in the art typically refers to a bonding material which cures under ambient conditions in the presence of moisture. "Heat cure" is a term employed in the art meaning an adhesive bonding material which cures primarily through the application of heat substantially throughout the entire curing process.

In trials of the technique, elevation of the temperature during the heating stage for up to one minute at 70°C ± 7°C has been found to reduce the curing time significantly (by for example an hour or more).

Heating to the required temperature level for 25 seconds has even been found to reduce overall cure to drive away acceptable limits by half.

Whilst the invention has particular applications for use in vehicle windscreen replacement (in that drive-away times are significantly reduced). It is envisaged that the technique would have technical and commercial benefit use

in other glazing applications, or indeed in other situations where screens, panels or the like require bonding.

CLAIMS:

1. A method of securing a glazing panel with an adhesive bonding material, the method comprising subjecting the bonding material to a predetermined temperature regime, the predetermined temperature regime having:

   (i) a period of heating the bonding material at a predetermined level; and

   (ii) a subsequent period of curing at a temperature significantly below the heating temperature level in step (i).

2. A method according to claim 1, wherein the adhesive bonding material is a moisture cure adhesive bonding material.

3. A method according to claim 1, or claim 2, wherein the predetermined level to which the adhesive bonding material is heated is substantially at or above 50°C.

4. A method according to any preceding claim, wherein the predetermined level to which the adhesive bonding material is heated is substantially at or above 70°C ± 7°C.

5. A method according to any preceding claim, wherein little or no curing of the adhesive bonding material occurs during the heating stages.

6. A method according to any preceding claim, wherein a bulk heating technique is utilised to heat the adhesive bonding material.

7. A method according to any preceding claim, wherein

dielectric heating is used to heat the adhesive bonding material.

8. A method according to any preceding claim, wherein microwave heating is used to heat the adhesive bonding material.

9. A method according to any preceding claim, wherein Radio Frequency heating is used to heat the adhesive bonding material.

10. A method according to any preceding claim, wherein ultrasonic heating is used to heat the adhesive bonding material.

11. A method according to any preceding claim, wherein heating by electromagnetic radiation is used to heat the adhesive bonding material.

12. A method according to any preceding claim, wherein following the heating stage the adhesive bonding material applied to secure the glazing panel is permitted to cure in situ in ambient conditions.

13. A method according to any preceding claim, wherein the heating stage is carried out when the adhesive bonding material has been applied to secure the glazing panels.

14. A method according to any preceding claim, wherein the heating stage is carried out prior to positioning the glazing panel and adhesive bonding material for securing.

15. A method according to any preceding claim, wherein the adhesive bonding material is heated contemporaneously

with (or immediately prior to) being dispensed from adhesive bonding material dispensing apparatus.

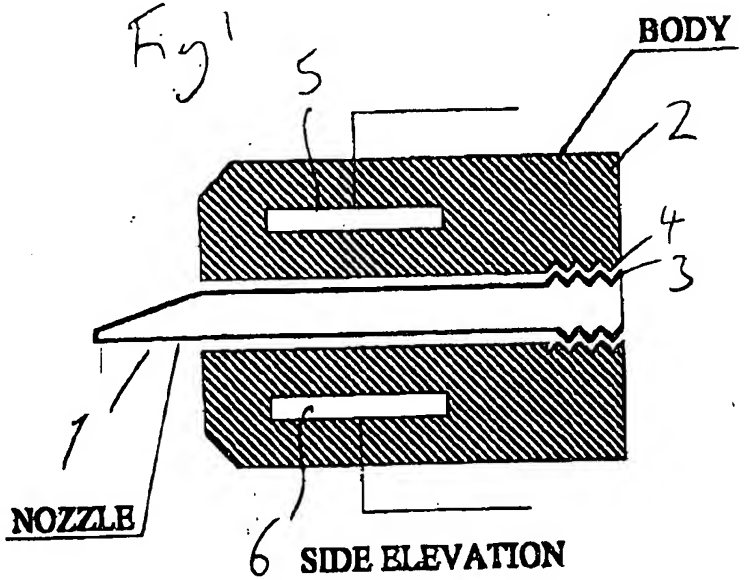
16. An applicator device for dispensing adhesive material, the applicator device including heater means for heating the adhesive material prior to or during dispensing of the adhesive material from the applicator.

17. A device according to claim 16, including a nozzle or nozzle receiving portion, the heater means being provided adjacent the nozzle or nozzle receiving portion.

18. A device according to claim 16, or claim 17, wherein the heater means is positioned and configured for heating of the adhesive material whilst present in the nozzle.

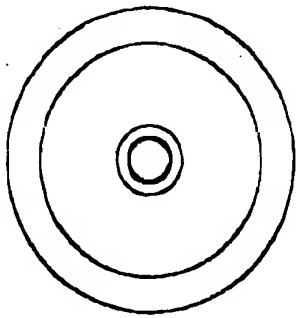
19. A device according to any of claims 16 to 18, wherein the device is configured to accept the adhesive material in canister or package form.

Fig 1



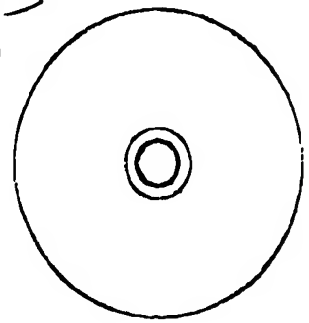
SIDE ELEVATION

Fig 2



FRONT ELEVATION

Fig 3



END ELEVATION

Item ref	Quantity	Title/Name, designation, material, dimension etc			Article No./Reference
Designed by Nigel James		Checked by	Approved by - date	Filename	Date 08/02/2000	Scale
MICRO WAVE GUN			BELRON PROJECT		
			DRAWING_NUMBER	Edition	Sheet